

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
Honolulu, Hawai'i

January 14, 2022

**Board of Land and
Natural Resources
State of Hawai'i
Honolulu, Hawai'i**

REGARDING: 2021 Annual Progress Report and Outcome Analysis Report, Mauna Kea Comprehensive Management Plan (CMP) (non-action item)

PERMITTEE: University of Hawai'i at Hilo

REPRESENTATIVE: Gregory Chun, Executive Director, Center for Maunakea Stewardship

LANDOWNER: State of Hawai'i; leased to the University of Hawai'i under General Lease S-4191

LOCATION: Mauna Kea Science Reserve, Ka'ōhe Mauka, Hāmakua District, Hawai'i

TAX MAP KEYS: (3) 4-4-015:009 (Maunakea Science Reserve)
(3) 4-4-015:012 (Halepōhaku)

ARE OF PARCEL: approximately 11,288 acres (Mauna Kea Science Reserve)
19.3 acres (Halepōhaku)

SUBZONE: Resource

ATTACHMENTS: Exhibit 1: University Management Areas on Maunakea
Exhibit 2: Google Earth Map of Observatories
Exhibit 3: Maunakea Background Information
Exhibit 4: selections from Maunakea Comprehensive Management Plan Outcome Analysis Report (Executive Summary, Introduction)
Online: [Maunakea Comprehensive Management Plan Outcome Analysis Report](#) (full report)

ONLINE LIBRARY: dlnr.hawaii.gov/occl/maunakea-management

BACKGROUND

On April 9, 2009, the Board of Land and Natural Resources approved the Maunakea Comprehensive Management Plan (CMP) for the Maunakea Science Reserve, including Halepōhaku and the Summit Access Road, Kaʻohe, Hāmakua District, Hawaiʻi.

On March 25, 2010, the Board approved four associated resource subplans which elaborated on the management actions contained in the CMP. The four plans were the Natural Resource Plan, Cultural Resources Management Plan, Public Access Plan, and Decommissioning Plan.

A condition of the approval is that the University Board of Regents, or its authorized designee, submit annual reports to the Board of Land and Natural Resources with information regarding the status of the development of each sub plan, and the status of the development of each management action.

The CMP is in the process of being updated. In support of this the University has prepared an Outcome Analysis Report (OAR) which describes the status of the resources in the plan area, summarizes the work that has been conducted regarding each of the management actions in the CMP, and outlines the progress made toward meeting the CMP's stated goals. The OAR will form the basis for any proposed revisions to the CMP. At the end of the process the revised CMP will be presented to the BLNR for consideration.

The OAR will serve as the 2021 Annual Report for this reporting period.

This and previous years' reports, as well as all active permits and management plans, are available on OCCL's website at dlnr.hawaii.gov/occl/maunakea-management.

RECOMMENDATION

OCCL is presenting the attached annual report as a "non-action" item on the Board's Agenda. We have invited a representative from the Center for Maunakea Stewardship to give a brief presentation to the Board.

Respectfully submitted,

S Michael Cain

Michael Cain, Planner
Office of Conservation and Coastal Lands

Approved for submittal:

Suzanne D. Case

Suzanne D. Case, Chairperson
Board of Land and Natural Resources

UH Management Areas

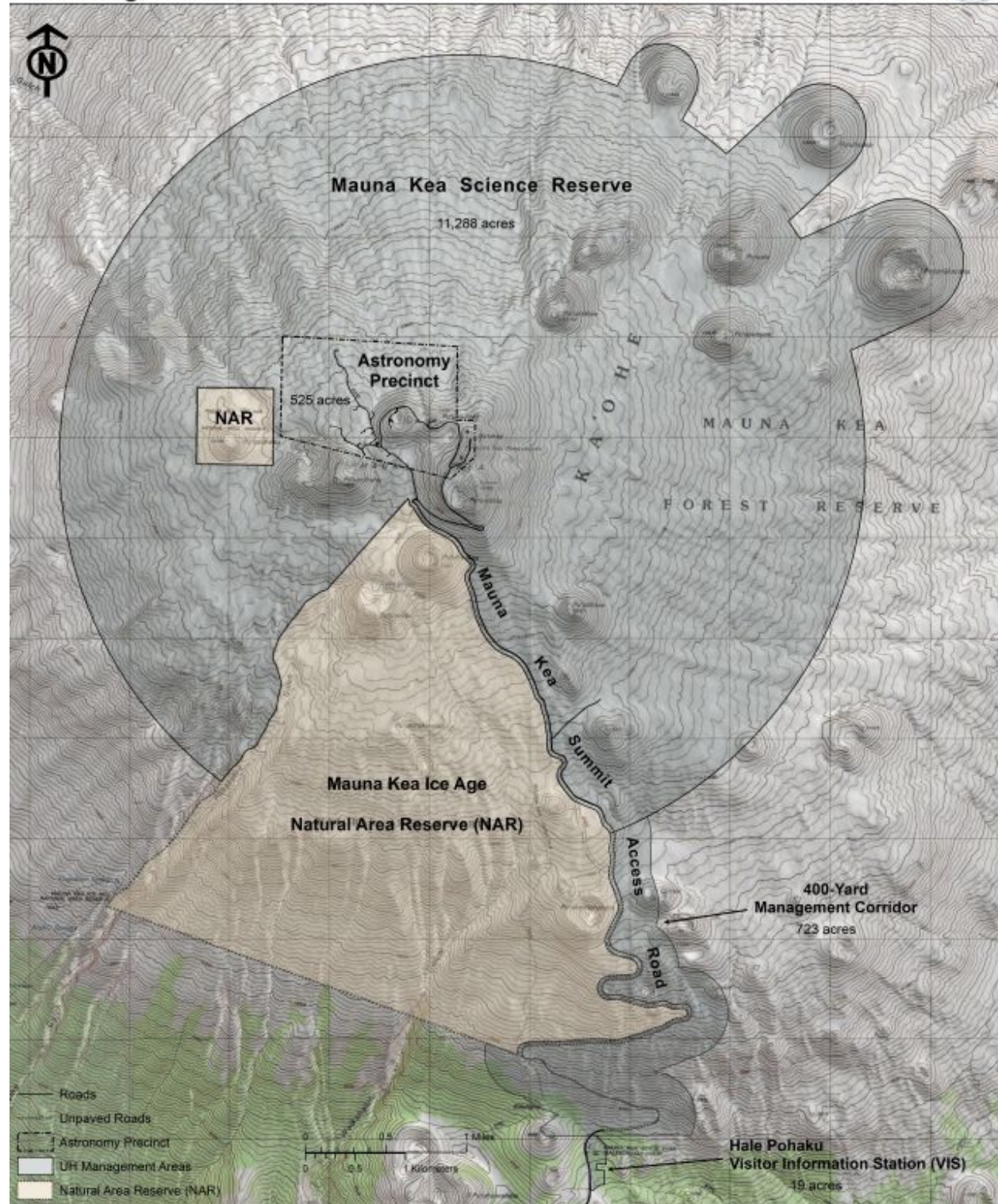


Exhibit 1: University Management Areas on Maunakea exhibits p 1

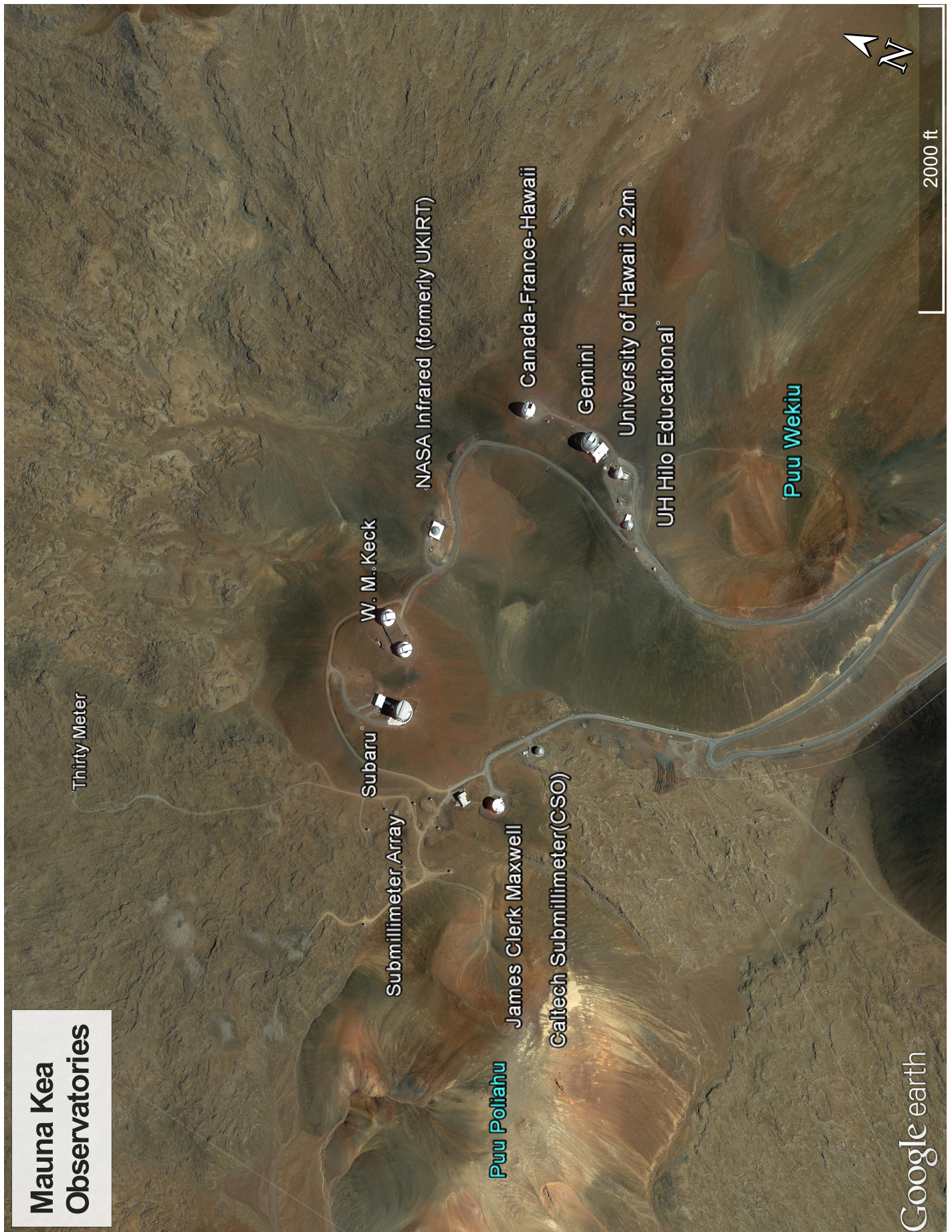


Exhibit 2: Google Earth Map of Observatories

THE MAUNAKEA SUMMIT

The **summit plateau** is an alpine desert ecosystem 3900 meters above mean sea level. The slope shifts abruptly here, from approximately 27% downslope to less than 10% on the plateau. Geological evidence indicates that this broad, circular region was formed by remnant lava flows in the former caldera, and subsequently sculpted by glaciers. The plateau itself varies only approximately 100 meters in elevation, but it is dotted with scattered cinder cones that rise 30 to 180 meters above the surface of the plateau. Other significant geological features are the outcrops of hawaiite, an olivine basalt formed via the interaction of glacial ice and hot lava, and prized for adze making; the alpine Lake Waiau; and remnant glacial from previous episodes of glaciation in the summit region. The highest point is 4205 meters.

Pu'u o Kūkahau'ula is the traditional name for the cluster of cones and ridgelines that are above 4080 meters. The names of the individual cones, Pu'uwēkiu, Pu'ukea, and Pu'uhau'oki, are believed to be more recent cartographic designations.

The State Historic Preservation Division identifies Kūkahau'ula, as well as Lake Waiau and Pu'u Līlinoe on the summit plateau, as traditional cultural properties.

The **north plateau** is the portion of the summit plateau to the north of Kūkahau'ula, identified as the Great Rocky Table Summit in an 1891 government survey.

The **lower summit region** is the alpine shrub and grassland ecosystem above the tree line at 2900 meters.

Maunakea's **lower slopes**, from approximately 2000 meters to the tree line, is composed of a māmane-naio forest.

COMPREHENSIVE MANAGEMENT PLAN

The Board of Land and Natural Resources approved a Comprehensive Management Plan (CMP) for University-managed lands on Maunakea on April 9, 2009. The CMP included management actions of previous management documents, including the 1995 Management Plan for UH Management Areas and the 2000 Mauna Kea Master Plan.

The CMP provides a framework and management guidelines ranging from the preservation of cultural and natural resource, to the management of the built environment, construction activities, and access to outreach and education.

The Maunakea CMP contains 106 management actions and associated reporting requirements. Four Resource subplans were approved by BLNR on March 25, 2010: the *Natural Resources Management Plan*; *Cultural Resource Management Plan*; *Public Access Plan*; and the *Decommissioning Plan*.

The Center for Maunakea Stewardship (CMS) submits annual reports to the BLNR discussing status of the implementation of each management section.

The University is currently developing an outcome analysis report, which will be used as the basis for proposed revisions to the CMP.

MAUNAKEA ADMINISTRATIVE UNITS

The Department of Land and Natural Resources (DLNR) managed areas in the summit region and upper slopes of Maunakea are the Mauna Kea Natural Area Reserve and the Mauna Kea Forest Reserve. The University of Hawai'i managed areas are the Maunakea Science Reserve, the Halepōhaku Midlevel Facilities, and the Maunakea Access Road between Halepōhaku and the summit.

The lower slopes of Maunakea also contain lands managed by or under the jurisdiction of the Department of Hawaiian Homelands, the U.S. Army (Pōhakuloa Training Area), and the U.S. Fish and Wildlife Service (Hakalau Forest National Wildlife Refuge). The County of Hawai'i maintains the Access Road below Halepōhaku.

Mauna Kea Forest Reserve: The Forest Reserve encompasses 52,500 acres, and is under the jurisdiction of DLNR's Division of Forestry and Wildlife (DOFAW). The māmane forest here is critical habitat for the federally listed palila.

Mauna Kea Ice Age Natural Area Reserve: The 2033-acre reserve was created in 1981. It is managed by DOFAW's Natural Area Reserve System. Among its unique geological and cultural features are the Keanakakoi adze quarry, Lake Waiau, and Pu'u Pōhaku. The Mauna Kea NAR is bounded by the Science Reserve and the Mauna Kea Forest Reserve.

The Maunakea Science Reserve is an 11,288-acre State-owned leased by the University of Hawai'i under General Lease S-4191, with day-to-day management delegated by the Board of Regents to the Center for Maunakea Stewardship (CMS). It contains most land within a 2.5-mile radius of the site of the UH 2.2-m telescope – in effect, all land above 3700 meters in elevation except for a pie-shaped wedge set aside as the Mauna Kea Ice Age Natural Reserve.

Halepōhaku is a 19.3-acre State-owned parcel below the summit region leased to the University of Hawai'i through 2041 under General Lease No. S-5529, which describes the character of use as "premises leased to be used solely for permanent mid-level facilities, a construction camp, an information station as well as existing facilities purposes." It is the site of the Onizuka Center for International Astronomy (Halepōhaku Mid-Level Facilities).

The portions of the **Summit Access Road** that extend from Halepōhaku to the boundary of the Science Reserve is also under UH management. This includes a 400-yard corridor on either side of the road, excluding those areas within the adjacent Mauna Kea Ice Age Natural Area Reserve.

DLNR MANAGEMENT RESPONSIBILITIES

The **Division of Forestry and Wildlife** (DOFAW) manages the Mauna Kea Forest Reserve, as well as outdoor recreation programs, trail and access systems, and the hunting program.

Land Division is charged with the management and enforcement of leases, permits, executive orders, and other encumbrances.

The **Office of Conservation and Coastal Lands** (OCCL) is responsible for the permitting and regulating of land uses in the Conservation District. Conservation District Use Applications are processed by OCCL, although the Board of Land and Natural Resources has the final authority to modify, grant, or deny permits. OCCL is also responsible for investigating potential land use violations and permit violations.

The **State Historic Preservation Division** (SHPD) is charged with preserving and protecting historically and culturally significant properties as outlined in the National Historic Preservation Act, the Statewide

Historic Preservation Plan, and Chapter 6E of the Hawai'i Revised Statutes. SHPD-managed programs include: Statewide Inventory of Historic Properties, Burial Sites Program, Certified Local Government Program, National Main Street Program, Historic Preserves Program, Information and Education Program, Interagency Archaeological Services, and maintenance of the Hawai'i and National Register of Historic Places. SHPD also reviews proposed development projects to ensure minimal effects of change on historic and cultural assets.

The **Hawai'i Island Burial Council** (HBC) falls under the jurisdiction of SHPD, and is responsible for the management of all human remains over fifty years old. Burial protection plans and burial treatment plans on Maunakea are required to be done in consultation with the HBC.

The **Division of Conservation and Resource Enforcement** (DCOARE) is responsible for enforcing all laws and rules that apply to lands that are managed by DLNR. Pursuant to Act 226 Session Laws of Hawai'i 1981, DCOARE's enforcement officers have full police powers to execute all state laws and rules within all state lands.

UNIVERSITY MANAGEMENT RESPONSIBILITIES

In August 2020 the University Board of Regents approved an internal reorganization of the management structure for University-managed lands.

- **The Center for Maunakea Stewardship (CMS)** will be the lead organization for the management of UH-managed lands on Maunakea. It will be responsible for the strategic implementation of stewardship programs, planning, permitting, compliance oversight, outreach, and research and academic coordination, as well as for fiscal planning and management. CMS will report directly to the Chancellor.
- **Stewardship Programs** will oversee the operations of the stewardship and support service operations, including . Maunakea Observatories Support Services (MKSS), cultural and natural resource programs, the Ranger program, and permitting and compliance.

Cultural, community, and stakeholder advisory groups will be integrated into strategic planning and policy discussion. These include:

- **Maunakea Management Board** is a body comprised of seven members of the community who are nominated by the UH Hilo Chancellor and approved by the UH Board of Regents.
- **Kahu Kū Mauna Council** will continue to advise the Board and Chancellor on cultural matters and issues
- **Maunakea Observatories Partners Group** will be established to provide input into decisions made by the University.

The University's **Institute for Astronomy** (IfA) will take the lead in coordinating scientific cooperation and partnerships. The **Imiloa Astronomy Center** will take the lead in cultural-based education.

MAUNAKEA OBSERVATORIES

There are currently eleven active observatories in the Maunakea Science Reserve, two non-operational observatories which are in the process of decommissioning, and one which has received a permit to begin construction:

Optical / Infrared Observatories

UH 2.2-m Telescope
NASA Infrared Telescope Facility (IRTF)
Canada-France-Hawai'i Telescope (CFHT)
United Kingdom Infrared Telescope (UKIRT)
W.M. Keck Observatory (Keck I and II)
Subaru Telescope
Gemini North Telescope
Permitted: Thirty Meter Telescope (TMT)

Radio Observatories

James Clerk Maxwell Telescope (JCMT)
Submillimeter Array (SMA)
Very Long Baseline Array (VLBA)

Non-operational

UHH 0.9m Telescope (Hōkū Ke'a)
Caltech Submillimeter Observatory (CSO)

The Very Long Baseline Array has been scheduled for decommissioning prior to December 31, 2033. The University has stated that there will not be more than nine operating astronomy facilities in the Science Reserve by December 31, 2033. One of the strategic issues that the revised Master Plan will address is the process needed to achieve this.

University of Hawai'i 2.2-meter Telescope (UH2.2)



The University of Hawai'i 2.2-meter telescope (UH2.2) was built in 1968 and became operational in 1970, making it the first large telescope built on the summit of Maunakea. It is currently owned and operated by the University of Hawai'i.

UH2.2 is the primary telescope used by UH professors, postdocs, and graduate students.

BLNR approved CDUP HA-954, an 'after-the-fact' permit, for the telescope in September 1977.

Canada-France-Hawai'i Telescope (CFHT)



and it began operations in 1979.

The CFHT is 3.6-meter optical telescope developed jointly by the University of Hawai'i, the Centre National de la Recherche Scientifique (France), and the National Research Council of Canada. The University of Hawai'i provides ten percent of the operating costs and one full-time staff person for CFHT as part of the telescope's tripartite agreement.

Approximately 15% of the observing time is dedicated to the University of Hawai'i.

BLNR approved CDUP HA-527 for the telescope in 1974,

NASA InfraRed Telescope Facility (IRTF)



to the University of Hawai'i.

BLNR approved CDUP HA-653 for the facility in 1975. It became operational in 1979.

The IRTF is a 3-meter telescope that was initially built to support the Voyager missions to Jupiter, Saturn, Uranus, and Neptune. It is currently operated by the University of Hawai'i under a contract with NASA.

Current science includes research on the aurora on Saturn, observations of ozone on Mars, spectral monitoring, and observations of the moons of the outer solar system planets. The facility continues to provide support for NASA missions.

Approximately 15% of the observing time is dedicated

United Kingdom Infrared Telescope (UKIRT)



Viewing time by the University of Hawai'i on UKIRT fluctuates between 15% and 50%, depending on funding and its partnership agreements.

BLNR approved CDUP HA-653 for the facility in 1975. It became operational in 1979.

The 3.8-meter UKIRT is the second largest dedicated infrared telescope in the world. UKIRT was originally owned by the United Kingdom. Ownership was transferred to the University of Hawai'i in 2014. It was then funded by NASA until June 2017, and operated under a cooperation agreement among Lockheed Martin Advanced Technology Center, the University of Arizona, and the University of Hawai'i. In June 2017 the UH Institute for Astronomy took the operations.

Very Long Baseline Array (VLBA)

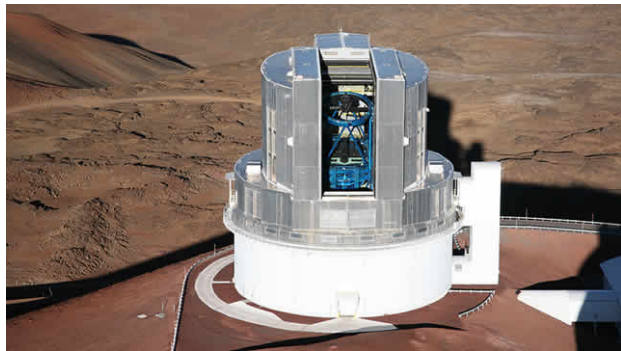


The Mauna Kea Very Long Baseline Array (VLBA) is one unit in an integrated system of ten identical radio telescopes stretching from the U.S. Virgin Islands to Hawai'i, which are operated remotely from Socorro, New Mexico. It is in the lower summit region at approximately 3700 meters elevation.

The VLBA has been operated by the Long Baseline Observatory (LBO) since October 2016. The LBO is a facility of the National Science Foundation operated under a cooperative agreement by Associated Universities, Inc.

BLNR approved the CDUP HA-2174 for the facility in 1989. The facility has been operational since 1992.

Subaru Telescope

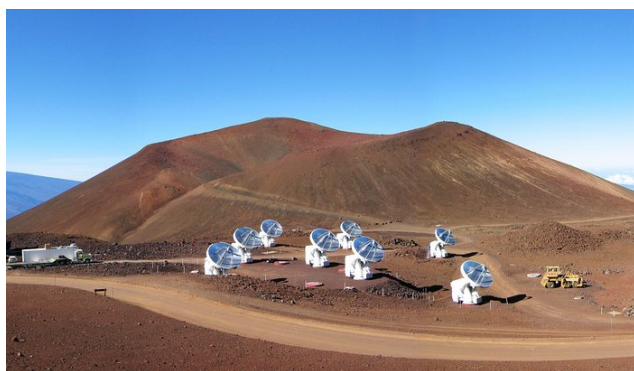


Subaru Telescope is an 8.2-meter optical-infrared telescope operated by the National Astronomical Observatory of Japan (NAOJ), National Institutes of Natural Sciences.

Fifty-two nights per year, approximately 15% of the observing time, are dedicated to the University of Hawai'i.

The BLNR approved CDUP HA-3462 for Subaru in 1992. It achieved first light in 1999.

Submillimeter Array (SMA)



SMA consists of eight 6-meter radio telescopes that operate as one unit. The telescopes can be arranged in varying configurations using 24 concrete pads.

The SMA is jointly operated by the Smithsonian Astrophysical Observatory and the Academia Sinica Institute of Astronomy and Astrophysics (Taiwan).

Between 12.5% and 15% of the observing time is dedicated to the University of Hawai'i.

BLNR approved CDUP HA-2728 for the array in 1994. The system became fully operational in 2003.

James Clark Maxwell Telescope (JCMT)



The 15-meter JCMT is the largest submillimeter telescope in the world, and contains the second largest mirror on Maunakea

In March 2015 the operation of the JCMT was taken over by the East Asian Observatory.

Between 12.5% and 15% of the observing time is dedicated to the University of Hawai'i.

BLNR approved CDUP HA-1515 for the telescope in 1983, and it began operations in 1987.

W. M. Keck Observatory (Keck I and Keck II)



The twin Keck Observatory telescopes primary mirrors are 10-meters, each composed of 36 hexagonal segments that work in concert as a single piece of reflective glass.

Keck Observatory is governed by the California Association for Research in Astronomy (CARA), whose Board of Directors includes representatives from the California Institute of Technology and the University of California, with liaisons from NASA and the Keck Foundation.

Approximately 10% of the observing time on Keck I and 15% on Keck II is dedicated to the University of Hawai'i.

BLNR approved CDUP HA-1646 for Keck I in 1984, and it saw first light in 1990. BLNR approved CDUP HA-2509 for Keck II in 1992, and it saw first light in 1993.

Gemini North Observatory



The Gemini Observatory consists of paired 8.1 meter optical/infrared telescopes, one in Chile and one in Hawai'i.

Gemini is operated by a partnership between the National Optical Astronomy Observatory (USA), National Research Council Canada, Comisión Nacional de Investigación Científica y Tecnológica de Chile, Institute for Astronomy University of Hawaii, Instituto de Astrofísica La Plata (Argentina), and the Laboratório Nacional de Astrofísica (Brazil).

Approximately 10% of the observing time is dedicated to the University of Hawai'i.

The BLNR approved CDUP HA-2691 for Gemini in 1994. The telescope saw first light in 2000.

Thirty Meter Telescope (TMT)



The core of the project is a 30-meter diameter aperture telescope composed of 492 individual mirror segments. TMT will be located on the north plateau, approximately ½ mile from the Kūkahau‘ula Summit, at an approximate elevation between 4008 meters and 4015 meters.

The telescope will be operated by TMT International Observatory, LLC, an international partnership between the California Institute of Technology, the University of California, the National Institutes of Natural Sciences of Japan, the National Astronomical Observatories of the

Chinese Academy of Sciences, the Department of Science and Technology of India, and the National Research Council (Canada).

Approximately 7.5% of the observing time will be dedicated to the University of Hawai‘i.

The BLNR approved CDUP HA-3568 for TMT in a Decision and Order in October 2017. The permit was upheld the Supreme Court of Hawai‘i on October 20, 2018. The Department issued TMT a Notice to Proceed on June 19, 2019. The university has stated that this will be the last new site developed for astronomy use on Maunakea.

DECOMMISSIONING PROCESS

The Maunakea Decommissioning Plan, a subplan of the Maunakea Comprehensive Management Plan, describes the process for decommissioning observatories on Maunakea. The plan defines decommissioning as a process that results in the partial or total removal of all structures associated with an observatory facility and the restoration of the site.

Provisions for financial planning for decommissioning are included to ensure that adequate funds are available to pay for the costs of deconstruction and site restoration at the end of the life of the observatory.

The Decommissioning Plan describes two options for removing the infrastructure:

- Complete infrastructure removal. This involves the removal of the entire facility, including underground utilities, pilings, and foundation to the extent practicable under normal engineering deconstruction practices;
- Infrastructure capping. Capping involves removal of above ground facilities with or without utilities and leaves all part of the underground portion of the facility in place.

The Plan describes three levels to which a site may be restored:

- Minimal restoration, meaning removing all man-made structures and grading the site;
- Moderate restoration, meaning removing all man-made structures, grading the site, and enhancing any native species habitat;
- Full restoration, meaning returning the site to its original topography and restoring any native-species habitat.

The decommissioning of an astronomy facility in the Science Reserve is a multi-step process involving

- Submitting a Notice of Intent.
- Completing an environmental due diligence review,
- Approval of the facility decommissioning plan by the University Board of Regents. Submitting a Conservation District Use Application which covers site deconstruction, observatory removal, and site restoration, and if necessary, a remedial action plan;
- Securing a Conservation District Use Permit (CDUP) from the Department of Land and Natural Resources.

MIDLEVEL FACILITIES AT HALEPŌHAKU (Onizuka Center for International Astronomy)

The 19.3-acre Halepōhaku parcel, TMK (3) 4-4-015:012, is situated at an elevation of about 9,200 feet on the south slope of Maunakea. The parcel is leased to the University of Hawai'i through 2041 by the State Board of Land and Natural Resources (BLNR) under General Lease No. S-5529, which describes the character of use as “premises leased to be used solely for permanent mid-level facilities, a construction camp, an information station as well as existing facilities purposes.”

The first cabins were built at Halepōhaku by the Civilian Conservation Corps in the 1930s to provide shelter for hunters and hikers. In 1982 the Board approved CDUP HA-1430 for the construction of a 12,913-square foot support services and common area building, three dormitories totaling 13,938-square feet with a 59-bed capacity, a 2500-square foot maintenance building, an 800-square foot generator building, and an 1181-square foot Visitor Information Station (VIS).

In June 2018 BLNR approved CDUP HA-3812 for parking and infrastructure improvements at the VIS. Work was completed early in 2020.

The lower portion of Halepōhaku contains two unimproved gravel parking areas, one of which is used for overflow parking for the VIS and the other as a staging area for construction activities. The overflow parking is often used by commercial tour groups if the paved parking area adjacent to the VIS is full.

The section of the Maunakea Access Road above Halepōhaku is also under University management.

LAND AUTHORIZATIONS ON MAUNAKEA

A. General Leases

The Maunakea Science Reserve encompasses 11,288 acres of State land leased to the University of Hawai'i under General Lease S-4191. The lease commenced on January 1, 1968, and is set to expire on December 31, 2033.

The character of use for GL S-4191 reads: *For a scientific complex and as a scientific reserve being more specifically a buffer zone to prevent the intrusion of activities inimical to said scientific complex. Activities inimical to said scientific complex shall include light and dust interference to observatory operation and certain types of electric or electronic installation on the demised lands, but shall not necessarily be limited to the foregoing.*

The Halepōhaku parcel encompasses 19.261 acres of State land leased to the University under General Lease S-5529. The lease commenced on February 28, 1986, and is set to expire on February 28, 2041.

The character of use for GL S-5529 reads: *The lessee shall use or allow the premises leased to be used solely for permanent mid-level facilities, a construction camp, an information station as well as existing facilities purposes.*

Grant of Easement No. S-4697 covering the Maunakea Access Road was issued to the University as of September 8, 1981. The easement is coterminous with GL No. S-4191, ending on December 31, 2033.

B. Subleases

The University currently has subleases with seven organizations for the purposes of operating astronomical observatories. Institutions were to build and operate observatories at their own cost and risk, in exchange for providing UH with time on the telescopes. Each sublessee, with the exception of TMT, pays the University a nominal fee of \$1.00 per annum in addition to giving the University a percentage of observing time on their respective telescope. UH used its dedicated time on the telescopes to build its astronomy program.

The subleases are:

1974: National Aeronautics and Space Administration, 70,650 square feet (NASA IRTF)

1975: Canada-France-Hawai'i Telescope Corporation, 2 acres (Canada-France-Hawai'i Telescope)

1983: California Institute of Technology, 0.75 acres (Caltech Submillimeter Observatory)

1985: California Institute of Technology, 2 acres (Keck I and Keck II)

1997: National Astronomy Observatory of Japan, 5.4 acres (Subaru)

1997: Smithsonian Institution, 3 acres (Smithsonian Submillimeter Array)

1997: Associated Universities Inc., 87,500 square feet (Very Long Baseline Array)

1997: National Science Foundation, 2 acres (Gemini North)

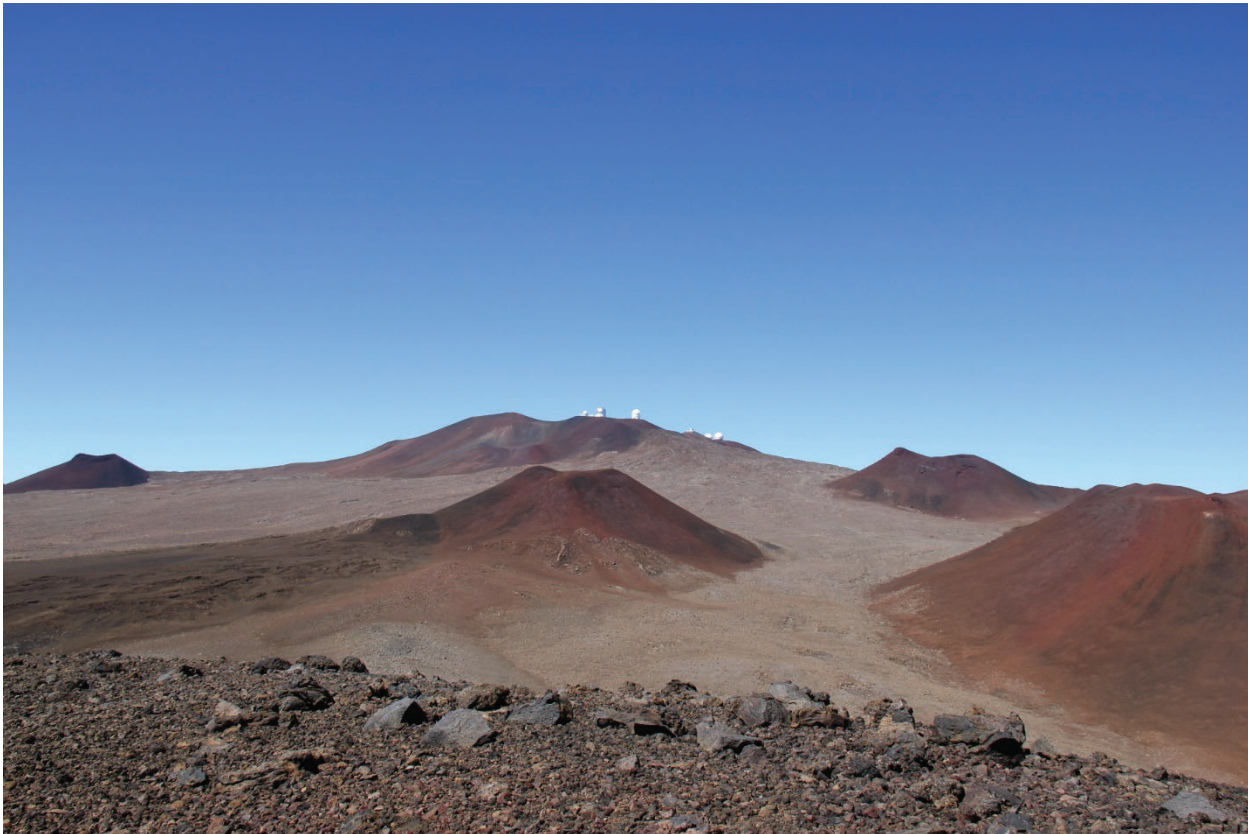
2014: Thirty International Observatory (TIO), 6 acres (TMT)

All subleases are co-terminus with the University's General Lease.

UH has notified all sublessees that in order to remain on Maunakea beyond 2033 they will be required to enter a new sublease which will have substantially higher fees.

MAUNAKEA COMPREHENSIVE MANAGEMENT PLAN OUTCOME ANALYSIS REPORT

COMPREHENSIVE MANAGEMENT ACTION MEU-1



The summit region of Maunakea. Photo September 2013, J. Kirkpatrick, OMKM

AUGUST 2021

NOTE TO READERS

This report contains several hyperlinks that were created during the transition of management responsibility from the Office of Mauna Kea Management (OMKM) to the Center for Maunakea Stewardship (CMS). CMS is now in the process of updating the website where documents related to Maunakea management are kept. This will result in the OMKM hyperlinks used in this report becoming inactive once the files are migrated to the CMS website (see website note below).

The Office of Maunakea Management merged with Maunakea Support Services in August 2020, creating the [Center for Maunakea Stewardship](#), which is responsible for UH-managed Maunakea lands. Please visit [the center's website](#) for more information. The migration of OMKM information to the Center for Maunakea Stewardship site is expected to be completed by the start of 2022.

EXECUTIVE SUMMARY

In 2009, the Board of Land and Natural Resources (BLNR) approved the *Mauna Kea Comprehensive Management Plan* (CMP). The CMP, which is the principal guide for the management of the University of Hawai‘i (UH) Management Areas, identifies 103 management actions related to the following four Management Component Plans (MCPs) and 12 “desired outcomes”:

- Understanding and protecting Maunakea’s resources (7.1)
 - Cultural resources (7.1.1; CR)
 - Natural resources (7.1.2; NR)
 - Education and outreach activities (7.1.3; EO)
 - Astronomical resources, activities, and uses (7.1.4; AR)
- Managing access, activities, and uses
 - Activities and uses (7.2.1; ACT)
 - Permitting and enforcement (7.2.1; P)
- Managing the built environment (7.3)
 - Infrastructure and maintenance (7.3.1; IM)
 - Construction guidelines (7.3.2; C)
 - Site recycling, decommissioning, demolition, and restoration (7.3.3; SR)
 - Considering future land use (7.3.4; FLU)
- Managing operations (7.4)
 - Operations and implementation (7.4.1; OI)
 - Monitoring, evaluation, and updates (7.4.2; MEU)

This *Outcome Analysis Report* (OAR), which is based on the most current available data, provides the information called for in CMP management actions MEU-1 and MEU-2. It describes the status of the resources in the plan area, summarizes the work that has been conducted regarding each of the management actions in the CMP, and outlines the progress made toward meeting the CMP’s stated goals (desired outcomes).

A draft of the OAR was circulated among stakeholders and agencies in order to: (i) inform them of the steps that UH has taken to date to implement the CMP’s 103 management actions; (ii) solicit their opinions as to the success and value of those measures; and (iii) obtain their suggestions regarding any adjustments (i.e., revisions, deletions, or additions) to management actions they believe should be made moving forward. In general, UH attempted to consult with all the government agencies having direct responsibility for regulating uses on Maunakea and organizations that have operations within or immediately adjacent to UH’s Maunakea lands. Because the focus was on parties having direct experience with management of activities on the mountain, the circulation was purposely kept narrower than the wide public distribution that is planned for the draft document outlining proposed updates to the CMP management actions which UH expects to issue in the fall of 2021.

All of the comments on the draft report that were received were reviewed and carefully evaluated, and revisions, where appropriate, are incorporated in this final report. CMS will use the information on program needs and recommended continuing and/or future management activities as UH finalizes its CMP progress report to DLNR and as the basis for adapting and/or adding CMP management actions in the years ahead.

This report is divided into the following chapters:

- Chapter 1 presents background information and outlines the intended purpose of the OAR.
- Chapter 2 presents detailed information concerning the present state of the cultural and natural resources within the UH Management Areas and the implementation of the CMP management actions associated with the desired outcomes related to those two resource categories (CR and NR).
- Chapter 3 contains detailed discussion of the many other measures that UH has implemented in accordance with the CMP. Those measures are related to the other ten desired outcomes.
- Chapter 4 summarizes the extent to which the UH's efforts have been successful in achieving the CMP's stated goals and objectives (desired outcomes) and identifies areas where additional effort and/or a correction in course, i.e., adaptive management, may be appropriate.
- Chapter 5 contains bibliographic references. This is followed by appendices which provide additional relevant information.

UH has made progress on nearly all the CMP's 103 management actions. Most importantly, in 2020 its efforts culminated in (i) the adoption of Hawai'i Administrative Rules (HAR) Chapter 20-26, *Public and Commercial Activities on Mauna Kea Lands* (the "UH Maunakea Rules" or "HAR Chapter 20-26"), and (ii) the recent creation of the Center for Maunakea Stewardship (CMS). As a result, UH is now in a better position to implement the CMP.

Overall, UH has made good progress toward achieving most of the CMP goals (desired outcomes) over the last ten years, including the governor's adoption of HAR Chapter 20-26, the Board of Regent's (BOR's) creation of CMS, and CMS's substantial progress in ongoing observatory decommissioning efforts. UH understands that some stakeholders believe that progress towards achieving management actions related to Native Hawaiian cultural resources and education and outreach are still inadequate, and the BOR, the President, and CMS are taking specific actions to address these issues.

As discussed in detail in this OAR and summarized in the table below, some management actions are complete after an express or implied action (e.g., preparation of a specific report) while other management actions (e.g., those requiring periodic and/or continuing action) are necessarily ongoing. UH has completed 15 of the CMP's management actions; no further action is needed for these.

Status of Management Actions by Category

Category	No. of Actions	Status			Discussion
		C	C/O	O	
Cultural Resources (CR)	14	8	1	5	2.1
Natural Resources (NR)	18	1	2	15	2.2
Education and Outreach (EO)	8	-	1	7	3.2.2
Astronomy Resource (AR)	2	-	-	2	3.3.2
Activities and Uses (ACT)	12	1	6	5	3.4.2
Permitting and Enforcement (P)	8	2	-	6	3.5.2
Infrastructure and Maintenance (IM)	14	-	3	11	3.6.2
Construction Guidelines (C)	9	-	-	9	3.7.2
Site Recycling, Decommissioning, Demolition and Restoration (SR)	3	-	-	3	3.8.2
Future Land Use (FLU)	7	1	-	6	3.9.2
Operations and Implementation (OI)	5	2	1	2	3.10.2
Monitoring, Evaluation, & Updates (MEU)	3	-	-	3	3.11.2
All Actions	103	15	14	74	
Key: "C" = Completed; "C/O" = Program framework completed; implementation is ongoing; "O" = ongoing					

As indicated in the "C/O" column of the table above, fourteen (14) of the management actions required UH to first establish an implementation framework and/or detailed procedures and then implement those procedures over the long term. The framework and procedures for all of these are now in place, i.e., the "establishment" part has been completed, and all are now being implemented (hence their "ongoing" nature).

All the remaining management actions (74) have from the outset involved ongoing implementation effort (see the "O" column in table above). The staff and facilities needed to accomplish this are generally in place, although some have been adversely affected by constraints related to the ongoing COVID-19 pandemic and/or the need for input from other agencies. UH will continue to implement these measures, adapting them as appropriate when it determines that the desired outcome that each one targets could be better achieved through a modified approach that is informed by its experience to-date.

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF THIS REPORT

1.1.1 BACKGROUND

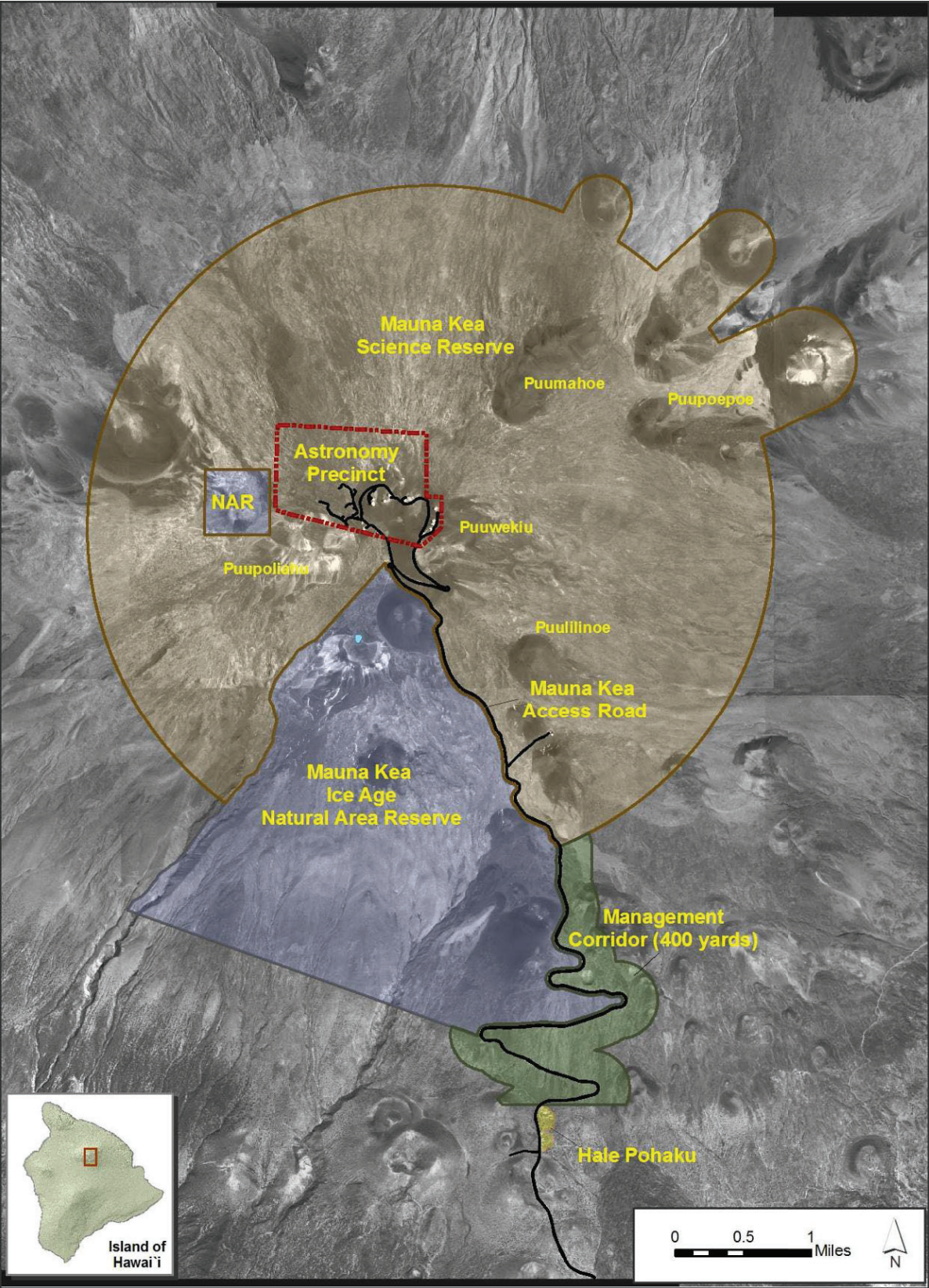
In April 2009, the Board of Land and Natural Resources (BLNR) approved, subject to conditions, the *Mauna Kea Comprehensive Management Plan* (CMP), an exhaustive and overarching plan guiding UH's administration of the "UH Management Areas." On March 25, 2010, the BLNR approved the four sub-plans (together, the "Sub-Plans") on which its approval of the CMP had been conditioned, thereby bringing the CMP into full effect. The CMP and Sub-Plans provide a framework for ensuring proper stewardship of the UH Management Areas. As used in this *Outcome Analysis Report* (OAR), "CMP" is inclusive of all five documents approved by the BLNR:

- The *Mauna Kea Comprehensive Management Plan, UH Management Areas* document dated April 2009.
- The *Natural Resources Management Plan for the UH Management Areas on Mauna Kea* document dated September 2009.
- The *A Cultural Resources Management Plan for the University of Hawaii Management Areas on Mauna Kea, Ka'ohē Ahupua'a, Hāmākua District, Hawai'i Island, State of Hawai'i* document dated October 2009.
- The *Public Access Plan for the UH Management Areas on Mauna Kea* document dated January 2010.
- The *Decommissioning Plan for the Mauna Kea Observatories* document dated January 2010.

The Office of Mauna Kea Management (OMKM) was the entity performing day-to-day implementation of the CMP during most of the period covered by this document, i.e., until the UH Board of Regents (BOR) approved the creation of the Center for Maunakea Stewardship (CMS) on August 20, 2020, at which time the transition from OMKM to CMS began. UH Management Areas during the period this document covers consisted of the following lands (see Figure 1-1):

- TMK 4-4-015:009, designated the Mauna Kea Science Reserve (MKSR) and leased to UH. The parcel is roughly 11,288 acres in size.
- TMK 4-4-015:012, known as Halepōhaku or the mid-level facilities and leased to UH. The parcel is roughly 19 acres.
- A portion of TMK 4-4-015:001, which is part of the Mauna Kea Forest Reserve, over which UH has a non-exclusive easement for the Mauna Kea Access Road. The easement encompasses roughly 71 acres.

Figure 1-1 UH Management Areas



Source: Figure 3-1, Maunakea Comprehensive Management Plan

- A 400-yard-wide corridor on either side of the Mauna Kea Access Road (except for portions of this corridor which fall within the Mauna Kea Ice Age Natural Area Reserve), which amounts to a roughly 670-acre portion of TMK 4-4-015:001 over which UH does not have any lease or easement. This corridor was originally included in the UH Management Areas in the Revised Management Plan for the UH Management Areas on Mauna Kea, dated March 10, 1995, and approved by the BLNR.

The CMP does not apply to areas not defined as UH Management Areas, although UH has actively sought coordination and consultation with neighboring landowners such as BLNR, DHHL, and others, since species and cultural resources, for example, know no boundaries.

1.1.2 PURPOSE OF THIS OAR

The CMP recommends management actions related to cultural resources; natural resources; education and outreach activities; astronomical resources, activities, and uses; permitting and enforcement; infrastructure and maintenance; construction guidelines; site recycling, decommissioning, demolition and restoration; future land use; operations and implementation; and monitoring, evaluation and updates. As stated on page 2-4 of the CMP, all the management actions were formulated in recognition that:

1. *Mauna Kea is a culturally significant site.*
2. *The high elevation areas of Mauna Kea represent a unique global resource that should be preserved for future generations.*
3. *Management activities will be focused on limiting the impacts of human activities on cultural and natural resources.*
4. *The planning and execution of resource management programs will involve input from the larger community (e.g., managers, scientists, educators, cultural practitioners, and the public).*

This OAR, which is based on the latest information available to its authors, provides the information called for in CMP management action MEU-1. It describes the status of the resources in the plan area, summarizes the work that has been conducted regarding each of the management actions in the CMP, and outlines the progress made toward meeting the CMP's stated goals (the "desired outcomes"). As required by the CMP, this OAR synthesizes information contained in the annual reports that the Office of Mauna Kea Management (OMKM), and in 2021 the Center for Maunakea Stewardship (CMS), has submitted to the BLNR each year since the CMP was adopted, with some additional information being included as appropriate.¹

CMS will use the information contained in this report to decide: (i) how best to adapt the measures it is presently implementing to better accomplish the desired outcomes of the CMP and (ii) to determine what, if any, additional actions it may be appropriate to implement.

¹ On August 20, 2020, the Board of Regents approved the creation of CMS which replaces OMKM. CMS is responsible for OMKM activities prescribed in governing plans and documents in addition to other responsibilities.

1.2 MANAGEMENT REPORTING

CMP management action MEU-1 calls for both annual reports and this periodic OAR (which the CMP also refers to as a “Progress Report” or a “Resource Status and Management Progress Report”). As summarized in Table 1.1, UH has submitted a total of eleven annual reports to the BLNR to date (see <http://www.malamamaunakea.org/management/comprehensive-management-plan>). Each annual report is cumulative, building on the previous year’s report. Thus, for example, the 2020 Annual Report, which is reproduced in Appendix A, discusses all the CMP management activities conducted between the time the CMP was approved and the end of the previous calendar year (i.e., December 31, 2019).

Table 1.1 Annual CMP Status Reports to BLNR

Report Title	Report Date
2010 Annual Report	April 8, 2011
2011 Annual Report	April 8, 2012
2012 Annual Report	April 9, 2013
2013 Annual Report	April 9, 2014
2014 Annual Report	April 9, 2015
2015 Annual Report	April 30, 2016
2016 Annual Report	September 2017
2017 Annual Report	August 2018
2018 Annual Report	August 2019
2019 Annual Report	June 2020
2020 Annual Report	February 2021
OAR (2021 Annual Report)	August 2021

This OAR was prepared in accordance with the following guidance contained in the portion of the CMP that describes the updating and revision process (see MEU-1 on page 7-65). This is the first OAR prepared and approved by the University; it builds on the cumulative annual reports listed above and serves as the 2021 Annual Report.

Five-Year Outcome Analysis Report

In preparation for the CMP five-year revision, OMKM shall prepare a Five-Year Progress Report that describes the state of the resources, the status of the various management programs, progress towards meeting CMP goals, and other relevant information. This report should be based on information obtained from Progress Reports, and any other pertinent sources.

The first section of the Five-Year Progress Report will discuss the state of the cultural and natural resources in the UH Management Areas. This section will summarize data collected during monitoring, research, restoration, and threat prevention and control activities conducted over the preceding five years.

This portion of the report will analyze trends in cultural and natural resources, and the impacts (positive, negative, or neutral) that management actions have had on them. It will also summarize what future management actions are needed to protect, enhance, or restore Mauna Kea’s natural resources.

The second section of the Five-Year Progress Report should include a summary of the progress of the programs towards meeting management goals, objectives, and

actions, as outlined in the CMP. This analysis will be based on information in the annual progress reports from the last five years.

The report will be reviewed and approved internally and will then be submitted to the stakeholders and agencies participating in the review process, allowing ample time before the meeting for the agencies to review it. This report, along with feedback received from stakeholders, will be used to conduct the five-year update of the CMP.

As noted above, the CMP mandates that this progress report contain two specific sections. The first of these, which discusses the state of cultural and natural resources in the UH Management Areas, is presented in Chapter 2 of this OAR. The second, which describes the progress that has been made towards meeting the CMP's management goals, is addressed in Chapter 4 of this OAR. In addition to these two required sections, this OAR contains an additional chapter, Chapter 3, that summarizes UH programs and assesses UH's work on CMP management actions other than those related directly to cultural and natural resources. Chapter 5 contains bibliographic references.

Management action MEU-2 of the CMP details the update and revision process for the CMP. It calls for stakeholders to be given a copy of this OAR so that they are aware of the current status of the mountain's resources and of the successes, failures, and ongoing activities, of the CMP-related programs and activities. Comments received on program needs and recommended continuing and/or future management activities will then be addressed as UH continues to adaptively manage implementation of the CMP.

Finally, UH submits an annual report to the State Legislature on the Mauna Kea Lands, pursuant to HRS § 304A-1905. This annual legislative report addresses land activities, current and pending lease agreements and fees, the status of current and pending administrative rules, income and expenditures of the Mauna Kea Lands special fund established in HRS § 304A-2170, and other issues that may impact the activities on Maunakea. Content from these annual legislative reports is included in this OAR only where it is relevant to the CMP.